ABSTRACT

A method of forming a relaxed silicon - germanium layer for use as an underlying layer for a subsequent ,overlying tensile strain silicon layer, has been developed. The method features initial growth of a underlying first silicon - germanium layer on a semiconductor substrate, compositionally graded to feature the largest germanium content at the interface of the first silicon - germanium layer and the semiconductor substrate, with the level of germanium decreasing as the growth of the graded first silicon - germanium layer progresses. This growth sequence allows the largest lattice mismatch and greatest level of threading dislocations to be present at the bottom of the graded silicon - germanium layer, with the magnitude of lattice mismatch and threading dislocations decreasing as the growth of the graded silicon - germanium layer progresses. In situ growth of an overlying silicon - germanium layer featuring uniform or non - graded germanium content, results in a relaxed silicon - germanium layer with a minimum of dislocations propagating from the underlying graded silicon - germanium layer. In situ growth of a silicon layer results in a tensile strain, low defect density layer to be used for MOSFET device applications.